

# Development of Advanced Detonation Modeling Methods for Hydrocarbon Propellants, Phase I

Completed Technology Project (2016 - 2017)



## Project Introduction

Many modern liquid rocket propulsion systems are utilizing hydrocarbon propellants (e.g. methane, RP-1). Testing of these new rocket systems will inherently involve the potential for large energy explosions. Current engineering methods do not address the probability of a detonation occurring and they are extremely conservative by attempting to equate the propellant vapor cloud explosion to a high-density explosive. The current project is leveraging CIF FY15 work done by NASA-SSC in which a validated tool for modeling hydrogen detonation and blast wave propagations in test facilities by following on to validate engineering level approaches for modeling the potential and associated blast environments for explosions of these hydrocarbon propellants.

## Anticipated Benefits

The ability to predict these blast environments is critical to the safety of the test/launch facilities and test articles in NASA as well as to other similar government test facilities and the development of such facilities and test articles within the growing industrial rocket engine development sector.

## Primary U.S. Work Locations and Key Partners



Blast resulting from hydrocarbon propellant during Space-X launch.

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Organizations Performing Work	Role	Type	Location
★Stennis Space Center(SSC)	Lead Organization	NASA Center	Stennis Space Center, Mississippi
Air Force Research Laboratory(AFRL)	Supporting Organization	US Government	Notre Dame, Indiana
●Space Technology Mission Directorate(STMD)	Supporting Organization	NASA Mission Directorate	

## Primary U.S. Work Locations

Mississippi	Ohio
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## Images



### Project Image

Blast resulting from hydrocarbon propellant during Space-X launch.  
(<https://techport.nasa.gov/image/35800>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Stennis Space Center (SSC)

### Responsible Program:

Center Innovation Fund: SSC CIF

## Project Management

### Program Director:

Michael R Lapointe

### Program Manager:

Ramona E Travis

### Principal Investigator:

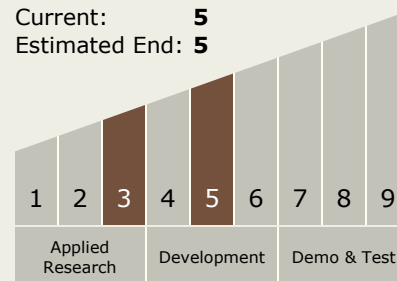
Daniel C Allgood

## Technology Maturity (TRL)

Start: **3**

Current: **5**

Estimated End: **5**



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## Technology Areas

### Primary:

- TX13 Ground, Test, and Surface Systems
  - └ TX13.2 Test and Qualification
    - └ TX13.2.2 Propulsion, Exhaust, and Propellant Management

## Target Destinations

The Moon, Mars, Foundational Knowledge